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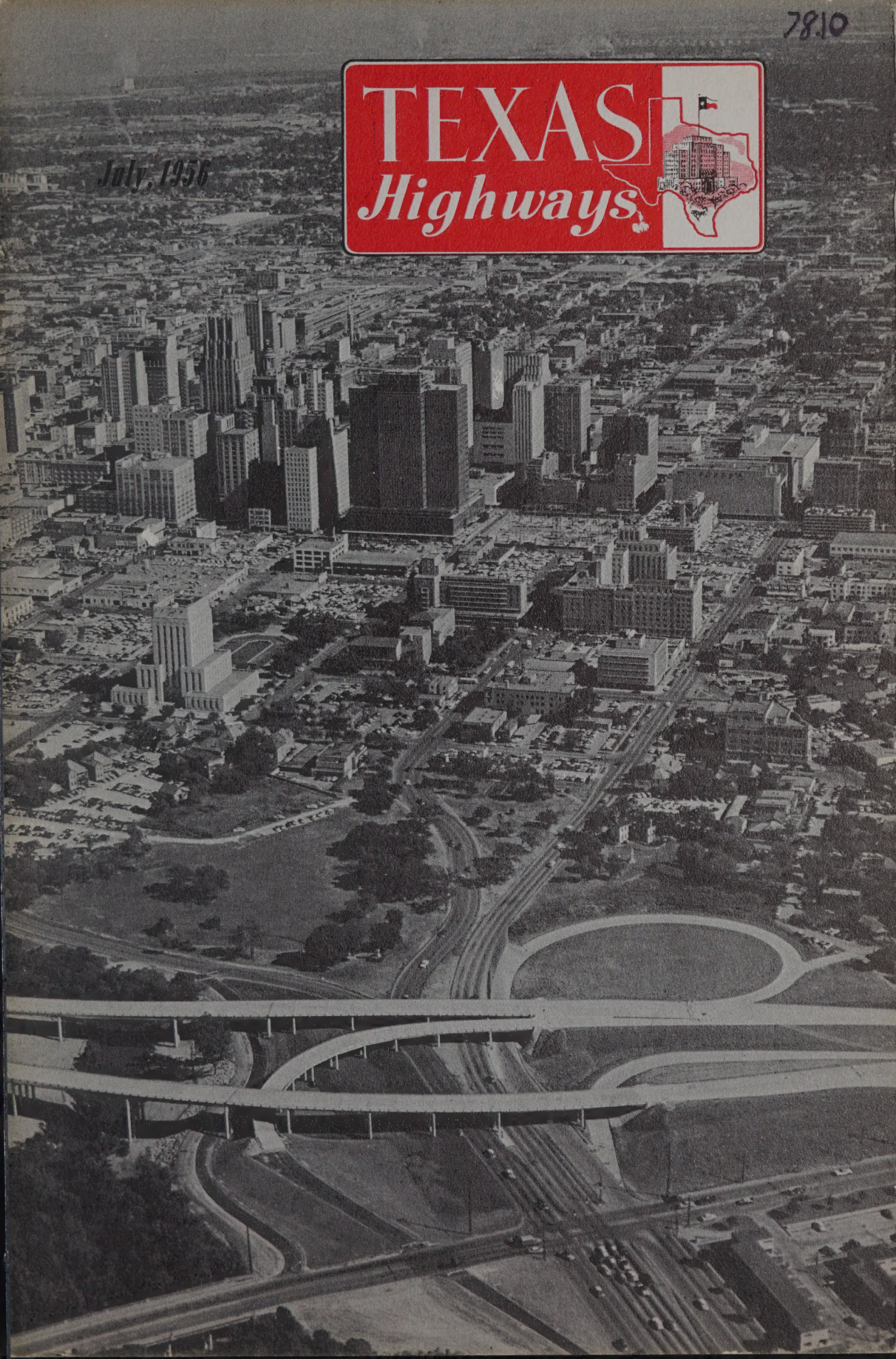
TEXAS Highways

July, 1956



Do You Know Texas ?

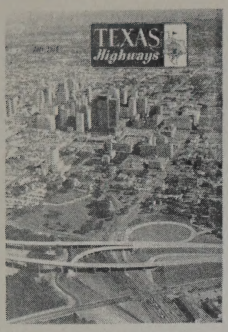
For outdoor-minded vacationers a favored spot in Texas is Garner State Park, situated at the highest point in Uvalde County. This park has 640 acres of varied terrain, and through it flows the lovely Frio River, with its banks of cypress trees, ferns, and mosses.

For campers who yearn for the open sky and the smell of wood smoke, camp sites are numerous and have adequate sanitary facilities. Popular too are the eighteen native-stone and hewn-timber cabins with large screened sleeping porches.

Nature has provided a never-ending source of enjoyment in the form of wildflowers, trees, and the pleasant sight of various protected game. For entertainment there is free swimming and fishing, and fish caught there include bass, perch, and catfish. A dance terrace overlooks the Frio River.

Named for former vice-president John Nance Garner, the park continues to grow in popularity with both native Texans and tourists.

About the Cover . . .



The business district of Houston forms an impressive background for the Gulf Freeway, representative of the modern expressways the Highway Department is building to help speed the flow of traffic. Now, the Department is conducting studies to find ways to make these expressways even more effective. Following a pilot study on the Central Expressway in Dallas, a study is in progress on the Gulf Freeway to determine traffic behavior in relation to medians and at the entrance and exit ramps. The objectives of the study and the procedures being followed are explained in an article, "Freeway Study," on Page 8.

Vol. III

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TEXAS Highways

The purpose of this publication, "Texas Highways," is to furnish a medium for presenting practical ideas and information. Employees are invited and urged to submit suggestions and relate experiences which would benefit or be of interest to Highway employees. These conclusions and data are not necessarily endorsed by the Highway Department nor are they to be construed as instructions.

Photographic services are available and other assistance may be obtained, if desired, in preparing material for submission. All material and comments should be directed to the Information and Statistics Division, Austin 14, Texas.

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COMPILED AND EDITED
Information and Statistics Division

SEAL COATS*

SELECTION OF TYPES AND CONSTRUCTION METHODS

J.A. Waller
Chief Engineer of Maintenance Operations

Before confining this discussion to the developments in design and method of seal-coat application in Texas, I would like to point out that this operation has been the subject of extensive study in recent years. There have been a number of excellent papers presented in meetings of organizations such as this which have contributed greatly to progress, particularly in the design phase of seal-coat application.

In my state we class seal coats as a primary tool of periodic maintenance. It serves as a low-cost treatment which arrests deterioration of the pavement, and has firmly convinced us of its merit. A specific and adequately financed program is set up each year to take care of work of this type. A majority of the work is performed by contract with the same degree of design and construction supervision given other highway improvement projects.

We feel that there are several factors which cause seal coats to be adaptable on a large scale in Texas. Due largely to our lack of serious problems from frost action, over 35,000 miles of the approximately 50,000 miles we maintain have a penetration-type surface less than one inch in thickness. It is primarily on these light surfaces that our seal coats are applied. While we sometimes place seals on highways carrying heavy traffic, it has been the general practice to use some type of asphaltic concrete on major highways, particularly where traffic is exceptionally heavy. Last year we sealed some 3,600 miles of highways using about twelve million gallons of asphalt and over 400,000 cubic yards of aggregate.

Before considering developments in design, it might be well to enumerate the features which we consider essential or desirable functions

*This speech was presented by Mr. Waller to the Western Association of State Highway Officials in Phoenix, Arizona, April, 1956.

of a seal coat.

1. A non-skid wearing course must be provided. It is our opinion that any seal coat which does not have a sufficiently aggregate-textured surface to provide this quality is a failure.

2. It should seal the old surface. In some cases the old pavement may have cracks caused by dry weather, normal movement of flexible base, or minor frost action which must be filled to avoid deterioration and loss. In others, the seal coat may serve to eliminate raveling of an excessively open pavement.

3. It may be desirable for a seal coat to increase the thickness of pavement. As mentioned earlier, a majority of our highways have thin surfaces and this is particularly true on our lower traffic farm-to-market roads where the original surface may consist of a prime and a one-course surface treatment.

4. The finished surface should have a light, uniform-colored, aggregate-texture appearance.

a. In many instances a seal coat greatly improves the general appearance of a highway by covering spot repairs and other blemishes in the pavement.

b. Although a light color is not essential, it is normally desirable for improved night visibility.

c. We have been using seal coats recently, in some instances, for delineation. Where we have a dark-colored pavement, a light-colored aggregate is used in shoulder sealing to provide a sharp contrast at the pavement edge. A sealed strip contrasting in color with the pavement and supplemented by paint stripes is also being applied in some instances as a divider on multilane highways where there is not a raised median.

DESIGN

Some discussion of past practices in Texas will provide a background for our developments in design over the last several years. In the past it was a standard practice throughout the state to use small aggregates graded from 3/8 inch downward and a relatively hard oil asphalt. At the time of application a considerable excess of aggregate was applied, and it was often necessary to continue applying aggregate throughout the remainder of the summer and sometimes again the following year. This design provided a smooth, fine-textured surface and there is no doubt but that it did a good job of sealing the old pavement. We now feel that many satisfactory jobs of that time were only possible with the light weight and volume of the traffic using them.

A few years ago, however, various factors made us aware of the unsatisfactory condition of our sealed pavement. In more and more instances we found that they were slippery when wet. Bleeding roads with necessary additional stone began to cause many complaints about windshield breakage and the increased volume and weight of traffic on these light seals was removing any semblance of a light or uniform color.

It was often found that the cost of curing approached the cost of initial application. Much of the material added was being whipped off and wasted. All of the factors pointed conclusively to the need to re-examine our thinking on this phase of highway work.

We feel that current designs are much more practical and give more assurance of obtaining desired results. The deficiencies just mentioned are largely overcome. We are able to better tailor this type of work to meet specific needs, and greater reliance is placed on scientific methods for determination of the various features in design. It might be generally stated that in our present design we are using a larger aggregate more uniform in size, with high voidage based on the theory of single stone mat thickness with a bituminous binder filling the lower portion of the voids.

As a general rule, the aggregate to be used will govern the other features of design. In selecting the aggregate, first consideration is given to the thickness of mat desired. This will depend, of course, upon condition of the pavement, traffic, and other specific features which contributed to the need for sealing. The mat thickness will be no greater than the average dimension of the larger stone particles. We agree with the theory which has been advanced in a number of recent papers on this subject that the ideal aggregate will be composed of stones of equal size. As a practical consideration, we realize that some spread from maximum to minimum must be allowed and this course is taken in our aggregate specifications. The trend has generally been toward a grade which has a 3/4-inch top size and eliminates the minus 1/4-inch material. By elimination of these minus 1/4-inch materials, we also eliminate much of the aggregate dust problem in addition to improving the grade and increasing the voids.

There are several types of aggregate used on seal coat work in Texas. They include washed gravel, crushed gravel, crushed limestone, and crushed natural limestone rock asphalt. While each of these materials has characteristics which influence its suitability for seal coats, all of them are being used and are providing satisfactory surfaces. All aggregate except limestone rock asphalt must have a resistance to abrasion not to exceed 35 per cent when subjected to the Los Angeles Abrasion Test.

While discussing aggregate types it might be noted that we have used a limited amount of precoated material. Where crushed limestone is used, the coating has consisted of from 1 to 2 per cent of a very high-penetration asphalt, or you might say, a very high-viscosity asphalt, which is applied to the heated aggregate in a bituminous mixer. Where limestone rock asphalt is used, the material is lightly fluxed-bringing out some of the natural asphalt. Where these materials have been used, there was no problem in their application by standard equipment. Their affinity for asphalt and elimination of dust are qualities which favor their use. The disadvantages we have considered are the limitations in stockpile period, and possible elimination of competition in some instances by some of the smaller producers on aggregate purchases. While our experience to date has been limited, use of this material is increasing and we feel that there is a place for precoated aggregate in seal-coat work.

After the grade and type of material is selected, the rate of application can be determined. This determination may be based in part on formulas, laboratory tests, and experience in use of any particular aggregate. The object is to determine the quantity of aggregate required to provide a mat of single-stone thickness. We feel that this is a most critical element of the design, as ap-

plication of an excess of aggregate causes stacking and improper embedment with loss of the larger size stones, and results in degradation of the aggregate with reduced percentage of voids.

The other major element in design is the determination of type and application rate of asphalt. It has been our general practice for a number of years to use oil asphalts on the majority of our seal coat work. In the selection of the grade of oil asphalt, we do not consider the hardness of the asphalt as a major factor in the stability of the mat. Whereas we formerly used lower penetration asphalt, we are still using some asphalt with a penetration of 120 to 150, but on the majority of our projects an asphalt of 150 to 200 penetration is used. In some instances asphalt of 210 to 250 penetration constitutes the bituminous binder. With the single stone principle, the asphaltic binder has the function of sealing the old pavement, providing a tack coat for the aggregate and holding the aggregate in position while filling the lower portion of their voids. Where traffic is light or where sealing the old pavement is the principal purpose of the seal coat, many of our engineers favor the higher penetration asphalt, with slightly lower penetrations generally used on the heavier traffic roads and on those where appearance and nonskid properties are most needed.

The selection of application rates on the other hand is considered an item of primary importance. Our general thinking is geared to selecting the rate of application which will provide sufficient bituminous binder to seal the old pavement and fill a proper portion of the voids. Factors influencing this determination are the average mat thickness of the aggregate and the voids in the aggregate, with adjustments included to compensate for condition of the existing pavement, traffic, and other factors which may vary from job to job. Here again we feel that much of the guesswork has been eliminated by combining theoretical computation and laboratory tests with experience. Where the aggregate is predominantly round or cubical, considerable weight can be given to the quantities derived from computation of mat thickness from screen analysis, and voidage may be determined by standard tests. Where aggregate contains a high percentage of flat or elongated particles, mat thickness can be more accurately determined from a test panel. With the rate of application necessary to properly fill the voids determined by computation and tests, a major portion of the asphalt rate has been established, reducing our dependence on experience and judgment to minor adjustments for the several factors which vary from job to job.

Under this design procedure we feel much more confident in our ability to set up the type of seal coat which is needed on any particular job. The use of somewhat larger aggregate, with high voidage, allows a tolerance in application rates which gives additional assurance of satisfactory results with much less critical reliance on the exact application rate or type of asphalt.

METHODS

In supervising the application of seal coats we feel that close control of asphalt and aggregate application, ample rolling, and adequate provisions for traffic should be provided.

In the application of asphalt it is, of course, essential that this material be placed uniformly at the proper rate without streaking or other irregularities. The temperature of the asphalt should be varied as necessary to provide the proper viscosity for application by the distributor. It might be noted here that there is a wide range in the temperature to which different asphalts used in this state must be raised to obtain the viscosity best suited for application. This quality is generally constant for

each of the different asphalt sources and can be determined from a simple temperature viscosity curve which our Materials and Tests Division has provided. A major problem in securing uniform application has been at the beginning and ending of each application. We require that a sufficient width of kraft paper be placed at the joint and that the distributor be in motion when the application is begun. Beginning and ending on paper insures a neat and uniform transverse joint. The greatest difficulty is in preventing what is usually referred to as streaking. This type of faulty construction shows up as narrow longitudinal sections either having an excess or deficiency in asphalt. Streaking is primarily due to interference between spray nozzle, improper pump pressure, improper spray bar height and/or clogged nozzles. Without going into elaborate detail at this time, I think it is sufficient to state that each of these items can be carefully checked and adjusted before application of asphalt is permitted.

As mentioned earlier in discussing designs, I pointed out that the aggregate rate is computed for a single stone thickness mat with no excess for stacking. With this design it is imperative that the aggregate distribution be as uniform as possible. The initial position of the aggregate when it reaches the pavement should be in large extent the place it is to stay; therefore, it is essential that great care be exercised in proper distribution of the aggregate from the mechanical spreaders, and any excess aggregate be removed by hand. We find that experienced men on the standard mechanical spreaders are capable of providing satisfactory distribution of aggregate. On many of our jobs it has developed that there is very little hand work to be done and this is generally at the joints at the beginning of rock lands. We formerly followed the initial aggregate spreading with a drag broom. With the greater care and initial spread now being exercised we have largely eliminated this drag-broom operation and in many instances a drag broom is not even brought on to the job.

While the thinking of our engineers still varies somewhat on the amount and type of rolling, this operation has been expanded in general practice throughout the state to provide adequate rolling to firmly seat the aggregate without relying on action of traffic. In reviewing recent contract jobs, I find that we are specifying about ten hours of rolling per mile of pavement. Rolling is generally performed by five-to-six-ton flat wheel and pneumatic rollers. Immediately after the aggregate has been applied we generally give an initial coverage with a flat wheel to set the aggregate. This is normally followed by pneumatic rollers operating at speed just below that at which suction from their tires tends to pick up unbonded aggregate, and is continued until it appears that all aggregate is firmly seated. In using the flat-wheel roller we find that close attention should always be given to assure that the aggregate is not being crushed and degraded to any appreciable extent.

We consider conditions on the road which influence the handling of traffic at the time the plans for each job are prepared. If shoulders are too narrow to carry traffic it is often provided in the specification that the seal will be applied to one-half the pavement at a time, and extra flagmen may be required where traffic in both directions must alternate in one lane. Fortunately, the majority of our highways have shoulders which can be used by traffic moving through the job. In these instances we set up an item for sprinkling to keep dust down and before projects are started our maintenance forces place the shoulder in the best possible condition.

Every effort is made to give motorists adequate and simple directions. Special attention is given to erection

of advance signs and barricades. In order to establish uniform procedure for flagmen, we have published a simple booklet of instructions. In those places where it is necessary or convenient for traffic to be stopped, we have found that passing out "Please Drive Carefully" cards, containing brief comments on the work in progress, assists in promoting good relations and cooperation. At locations where there is loose aggregate on the pavement, special signs to warn the motorist are erected. We know that these measures are paying off in convenience to the public, and greater safety for the public, and also for those performing the work.

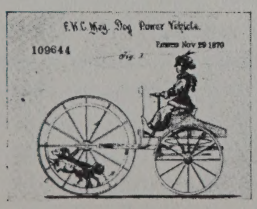
The final operation is removal of any aggregate which is not bonded. When you consider that for many years it was our normal practice to keep surplus aggregate on the pavement for weeks following application of seal coats, removal of all curing material is indeed a drastic change. You might say this is a test of the design. On the morning following application, or the morning after rolling is completed, and while the pavement is still cool, any loose stones are removed with a rotary broom. With some care exercised to see that the broom elevation is high enough to avoid pulling out bonded material from the still tender mat, we have found it to be a simple and effective operation. While the primary objective is to reduce the flying stone hazard, we believe loose stones under the traffic also tend to dislodge bonded aggregate and by filling voids, raise the elevation of the bituminous binder, which could result in bleeding.

In concluding, I would like to emphasize the statement that the seal coat is a primary tool of periodic maintenance, and that it should be given engineering attention on a par with that given other phases of highway administration, design, and development. It can serve as the stitch in time, it can save lives, it can improve appearance or provide contrast for highway lanes and it can serve as a step in stage construction. On the other hand, a seal coat can be too little and too late, it can create a death trap, and it can be a road hand's nightmare. This we can say from experience. With so much to gain or to lose, it behooves all of us to continue our efforts in continued development of seal coats. While we are confident that our present use of this tool is a great improvement over our past practices, it is recognized that there is still a wide latitude for development of designs, materials, and methods to utilize the full potential of seal coats in highway operations.

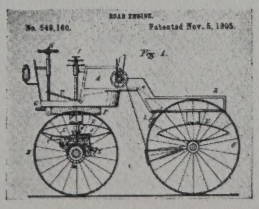
● ● ●

A DOGMOBILE

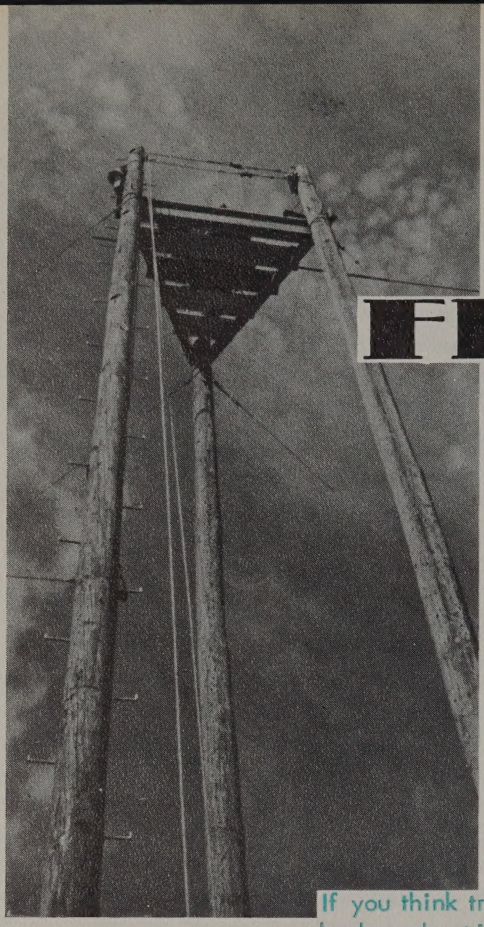
Curious as it may seem a patent for a dog-powered vehicle was registered November 29, 1870. It is shown here. Another type of road engine of the vintage 1895 is shown in the other small illustration. Apparently the 1895 version had a front wheel drive and was the runabout type.



This proposed machine was patented in 1879.



A later version of powered vehicles, 1895.



FREEWAY STUDY

Mc D. Shelby, Supervising Research Engineer
Road Design Division

If you think traffic is terrible and that something should be done about it, read this article. It may soothe you to learn that something is being done—every day. Houston citizens driving on the Gulf Freeway unknowingly lent a helping hand in freeway research studies recently when their traffic behavior was filmed from atop this 50-foot tower.

The study of highway design as related to driver behavior, safety, and traffic capacity is and should be a continuing function of the Department.

Latest undertaking has been preliminary studies on both the Dallas Central Expressway and the Houston Gulf Freeway. These studies were made in an effort to develop techniques for use in an over-all research study entitled "Correlation of Design and Operational Characteristics of Expressways in Texas."

This project is part of the cooperative research being conducted for the Department by the Texas Transportation Institute of A & M College.

Public interest was aroused by the Gulf Freeway Study. The 50-foot tower built alongside the Freeway to provide a vantage point for two movie cameras and operators caused some motorists to slow down and have a "look" the first two days after erection. However, newspaper publicity plus a week end seemed to give the motorists time to become acquainted and resume their normal pattern of operation.

The tower, erected adjacent to the Cullen Street Overpass, was first used by the cameramen on May 21, but the pictures taken on May 22 will be the first used in the study.

One of the main objectives was to study traffic behavior in relation to

Freeway medians. Cameramen on the tower shot pictures along the Freeway as it is now, and will take more pictures after a barrier fence is built down the median the length of the Freeway. From these movies the reaction of motorists to the barrier fence can be determined—whether they shy away from it, or whether they draw closer to it, feeling safer with the fence there.

the afternoon the crew observed during the peak hours from 4:30 until 6.

The idea of using a tower for filming came about after a preliminary pilot study on the Dallas Central Expressway in which a helicopter was used. This method proved unsatisfactory for the purposes desired. A ladder truck was also used in this Dallas study, which proved very satisfactory. Since a ladder truck could not be

The clock and the four white lines spaced 176 feet apart were used in determining speed of vehicles.

Another objective is to study traffic behavior at the entrance and exit ramps to determine the effect cars entering from frontage roads have on cars in the freeway lanes. After the study, it may be found that closing certain entrances during peak hours will speed the flow of traffic in the freeway lanes.

A clock was mounted so that it would show in all pictures taken of the traffic flow. From this clock, synchronized with the movie camera, and white lines painted on the roadway, the speed of cars traveling on the Freeway can be determined.

Traffic was filmed during the peak hours from 6:45 A. M. until 8:15 A. M. and during the off-peak hour from 9:30 until 10:30 in the morning. In

From this 6 by 5 vantage point movies will be made of traffic behavior on the Freeway.

Part of the study will be concerned with congestion at frontage road intersections.

parked on the Gulf Freeway, a tower seemed to be the most practical method for obtaining the same results the ladder truck gave.

Two movie cameras are being used which hold 400-foot reels. These reels run about 22 minutes, and as one camera runs out, the other camera takes over. With these movies, which will be studied frame by frame in a movie editing device, the Institute will be able to observe traffic behavior on the Freeway at close hand. From this study, the Department hopes to come up with improvements in freeway design and develop techniques which will be used on future freeway studies in Texas.

Mc Shelby and Ralph Rich of the Department discuss possibilities of the study with Gene Maier of the City of Houston and Abe Tarigin and Frank Anderlitch of the Bureau of Public Roads.

Tape placement equipment was borrowed from the Bureau of Public Roads (Described in TEXAS HIGHWAYS, February, 1956), and was also used in the study. The placement tape survey ran from 1 P. M. until midnight. From this survey, traffic placement and speed were determined. Valuable assistance in properly setting up the tape placement equipment was rendered by representatives of the Bureau of Public Roads, who spent three days on the project. Excellent cooperation by the Houston Police Department made it possible to install this equipment under heavy traffic volumes. Data from both types of surveys will be reduced to punched cards and tabulated automatically.

The over-all project is under the general direction of an advisory committee composed of a representative of the Texas Transportation Institute, the City of Dallas, the City of Houston, and the Highway Department.

After the study is completed, the Institute will give the Department a report on findings from which it is expected further freeway studies will be planned.

ASPHALT EDGER

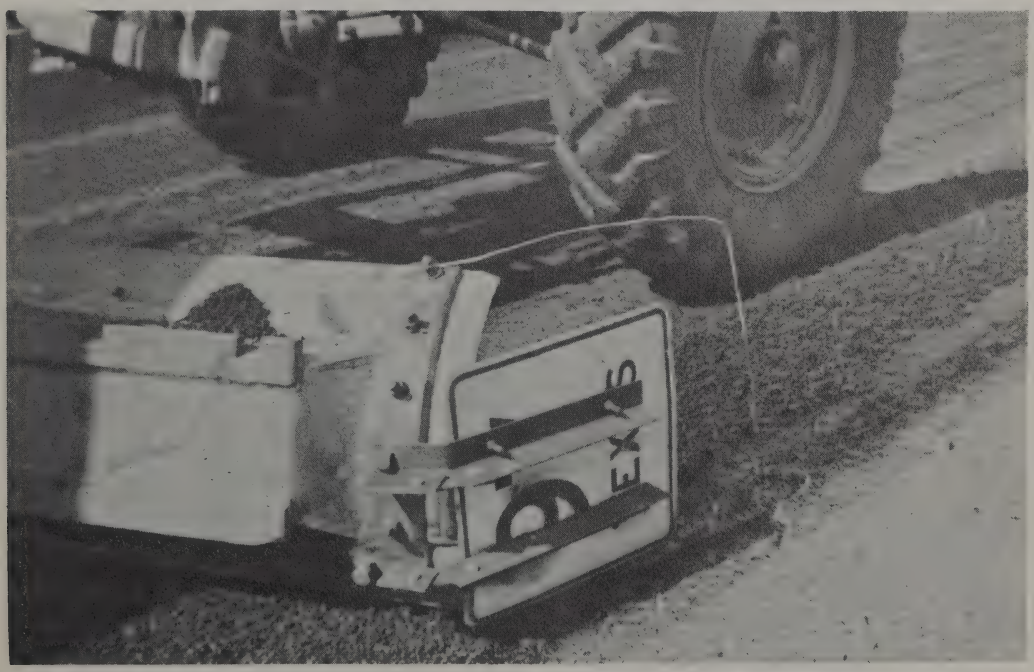
B.R. Wood, Senior Maintenance Foreman
District 15

In the past, various methods were used to maintain a true line on the edges of bladed asphalt patches and surfacing. Sometimes string lines were set and a thin line of asphalt was placed by hand. This method was effective, but very slow and expensive, and due to changes of elevations along the old pavement the asphalt spilled over the edge in places where the high spots occurred, leaving an uneven alignment.

After a discussion with Emil Baumann, Semi-Skilled Laborer operating our maintainer, we came up with the thought that if a plate was mounted on the point of the blade when the higher spots were encountered on the old pavement, the excess asphalt would be distributed evenly to the lower elevation without spilling over the point of the blade.

As can be seen in the picture, an old metal sign was used with heavy angle-iron supports. Vertical slots were cut in the plate to facilitate higher or lower adjustments as needed. The bottom edge of the plate should be approximately two inches or more, depending on the thickness of the old asphalt surface and the amount of new asphalt being laid and should travel as close to the road base line as possible. The wire guide was placed later to help keep a true course.

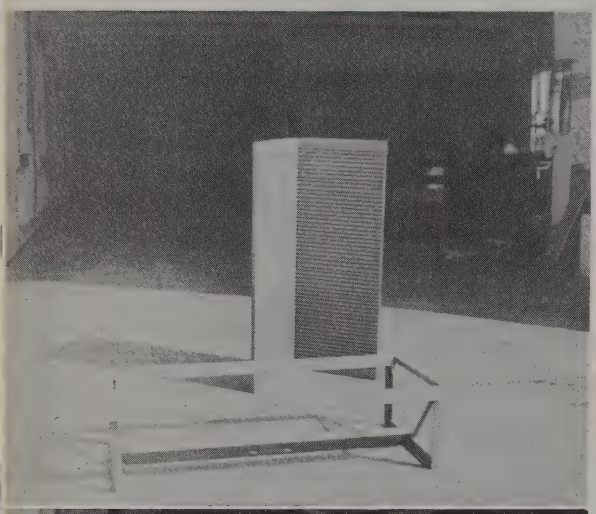
We are pleased with the results of this attachment, not only because of the more uniform alignment of the edges, but also for the saving of labor and material.



SIGN

DISTRICT 7

R.N. Jennings, District Maintenance Engineer



All of the districts have mutual or similar problems and are continuously working to improve methods. One problem which all the districts share is that of storing signs after painting, or stacking them for transporting so they won't be damaged. On these pages are methods devised in two of our districts for handling the sign-storing problem.

Many of our carefully and expensively manufactured signs are damaged in transportation and storage. For this reason, District 7 requires that steel signs be transported and stored in racks separating the signs.

H. P. Largent, Senior Maintenance Foreman at Ballinger, has devised a rack that is simple and effective. It consists of two parts, one a frame of light metal shapes, and the other a slotted wooden rack.

Photographs illustrate this rack.

RACKS

DISTRICT 21

N.E. Bryan, Sign Supervisor
and
George Goeser, Skilled Laborer

A sign rack was built by District 21 Paint Shop to facilitate the handling of metal sign blanks while drying between coats of paint.

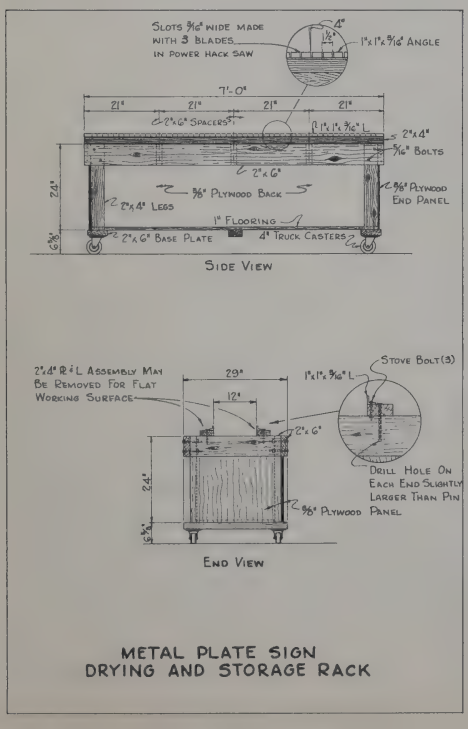
The four-degree angle cut in the one-inch angle iron will cause all signs to lean in the same direction and prevent contact between them.

The table top is left open so that any size or shape sign may fit in the rack. When not in use the rack may be replaced with a flat top and utilized as a work table.

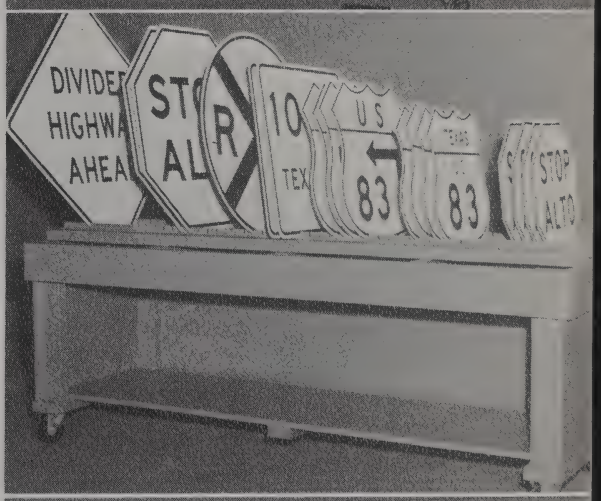
The twelve-inch spacing between angles may be varied but we found this spacing will handle signs any size or shape satisfactorily.

When a rack for plywood signs is desired the angles may be replaced by the one shown in the first picture.

This rack was made of two-by-four lumber and five-eighths-inch dowel pins spaced on two-inch centers three inches long. It will handle any size plywood sign.



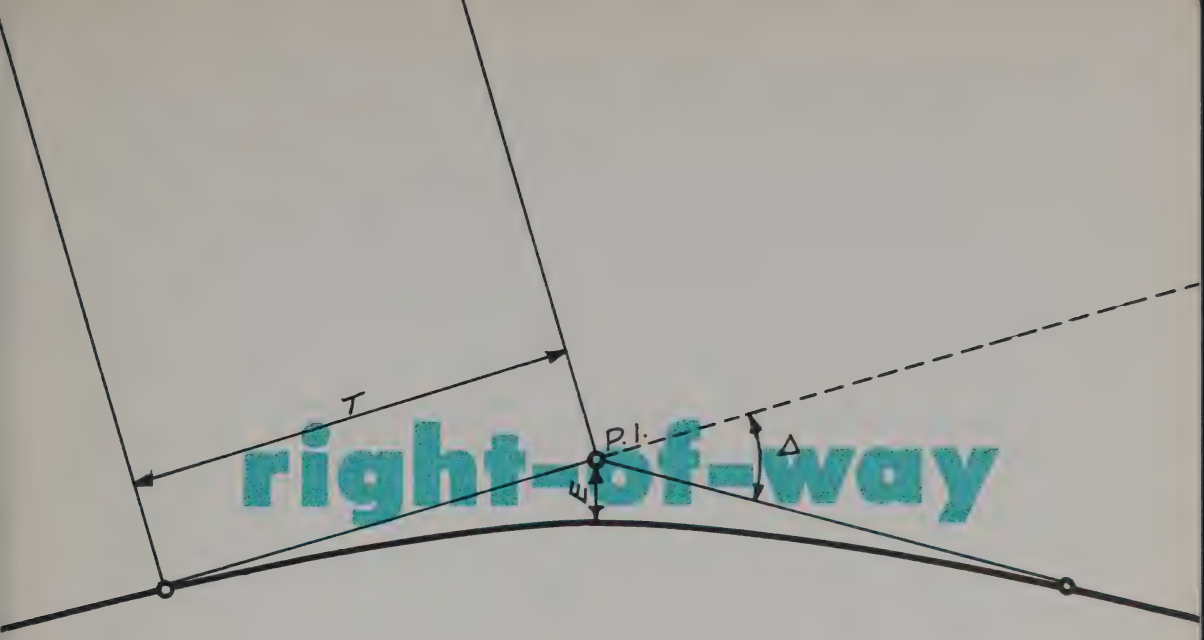
METAL PLATE SIGN
DRYING AND STORAGE RACK



THE INTERSTATE HIGHWAY SYSTEM

DID YOU KNOW?

The Interstate System of highways was established by the Seventy-eighth Congress on December 20, 1944. By law, the system shall not exceed 41,000 miles, connecting the principal metropolitan and industrial areas, and connecting with roads in Canada and Mexico of continental importance. Texas has 2,905 miles on the Interstate System.



right-of-way

George S. Meyer, Senior Resident Engineer
District 15

This article is written with the hope that it may help others in surveys, calculations, and preparation of right-of-way data by examining methods used by the survey section of the San Antonio Expressway Office and notes which are the writer's personal opinion.

It has been observed that preparation of right-of-way maps and deeds is one of the most important, most distasteful jobs handled by the Highway Engineer. Whoever is in charge of such work must necessarily be directly responsible for accuracy of surveys, calculations, and establishment of property lines.

In the Model "T" day it was sufficient to survey a proposed highway center line on the ground, tie in physical property lines by station and angle, and prepare field notes based on a strip of land of uniform width parallel to the proposed highway center line. The counties would then fence the right of way, or portions of it. During the later stages of construction, after the center line had vanished, together with its important references, stakes had to be set for the construction of right-of-way markers. How this was accomplished is not known, but from the remains it is obvious that when fence posts were encountered, markers were set one foot or more from their correct location. Those established in fields are usually leaning over and measurements now do well to check across the highway within one-half a foot. The establishment of these markers all occurred when right of way was donated or purchased for a few dollars an acre. Having resurveyed sections of the existing highways, it has been found that some right-of-way markers have been off as much as ten feet, causing considerable confusion when private surveyors used these points. From these points fences, streets and other improvements have now been construct-

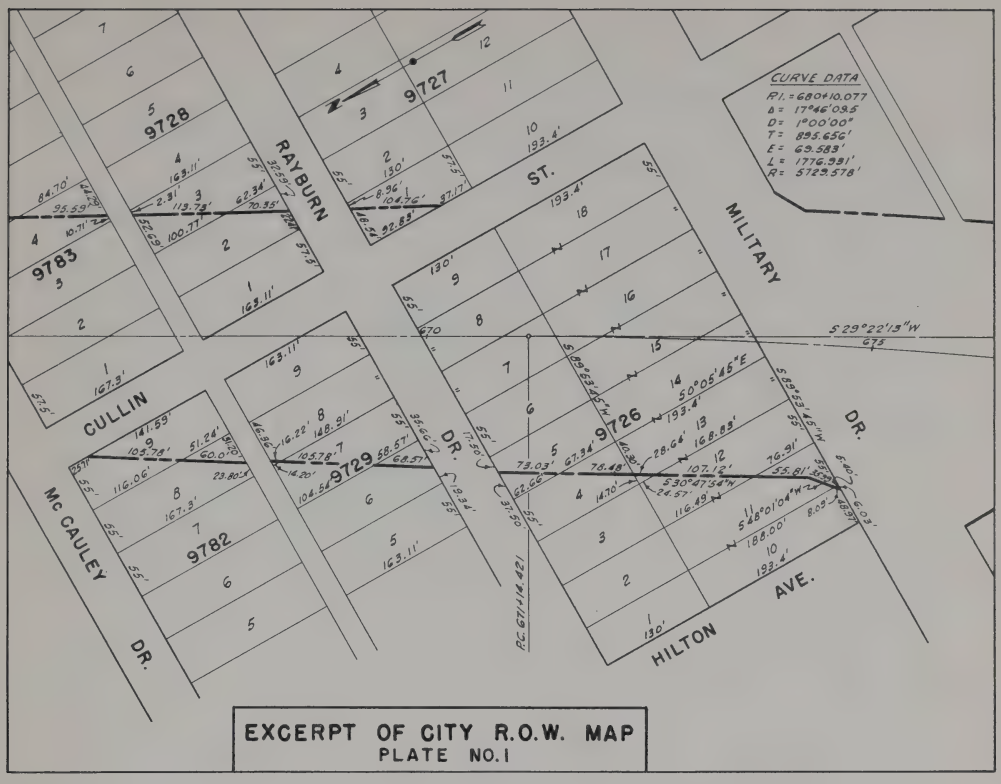
ed. This can now only be settled by a resurvey of the entire area and court action.

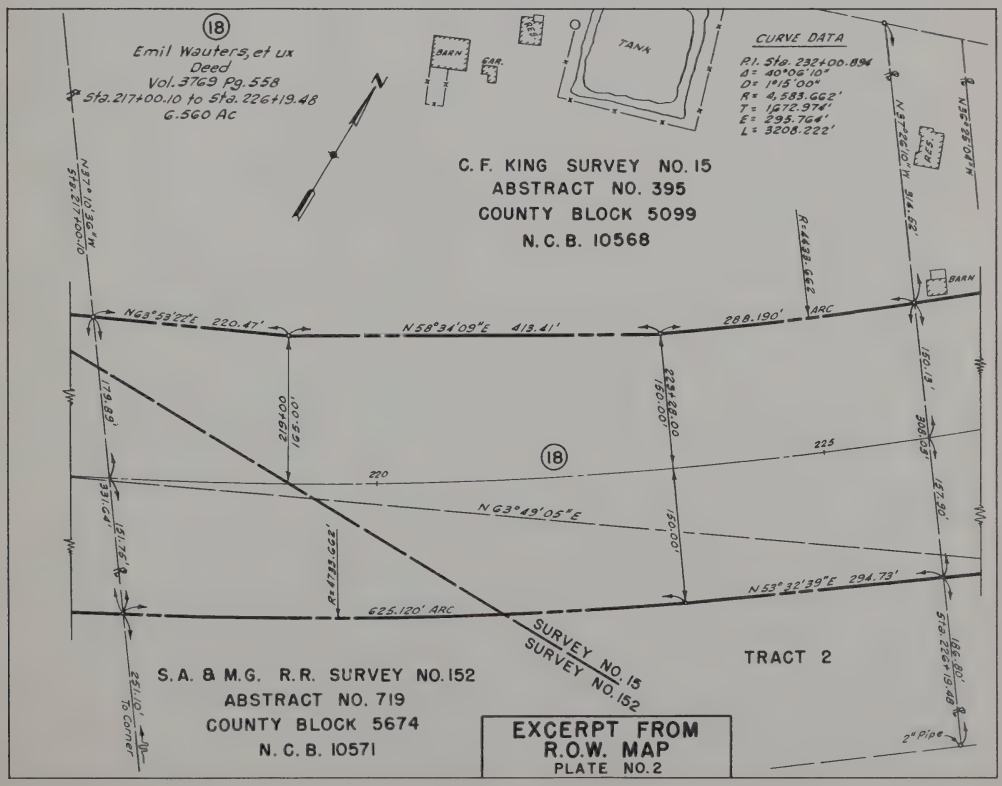
Due to the rapid expansion of our metropolitian area, the price of this originally cheap land is now $7,000 an acre in some major areas and surveys should now be correct at least within an accuracy of 1:10,000. Needless to say, careless and inaccurate surveys and inaccurate field notes are now causing private surveyors quite a few headaches. Also, since it is now the custom for land surveyors to use one-half-inch iron reinforcing rods for survey corners, this type of point definitely should not be used for grading hubs during construction. It is the writer's opinion that highway engineers cannot now delegate the job of surveys and preparation of right-of-way data to subordinates and sign a beautifully drafted right-of-way map. Right of way must be staked accurately on the ground, acreage and courses must be mathematically correct, and field notes must be properly written so that in future years all those who must use them can do so without question.

In the development of a freeway or expressway project it is not feasible or practical to survey directly on the ground the highway center line due to factors which influence location, and physical obstructions. The highway center line in urban areas can only be staked after the right of way has been purchased and cleared. As discussed in a previous article, "Urban Highway Layout by the Coordinate System," (see November 1953 Texas Highways) it is most advantageous to use the coordinate method of computations for design alignment, surveys, and right of way. Coordinates are used to simplify calculations and provide a computer with a method of checking his own work.

In the San Antonio area there are two separate and distinct right-of-way requirements. First, when the City of San Antonio purchases right of way and second, when Bexar County purchases the right of way within the city limits of San Antonio.

The City purchases all right of way in the name of the City of San Antonio and requires a right-of-way map showing only the property required (See Plate 1). The right-of-way map from which this Plate was prepared is to a scale of 1" = 100'. Also, field note descriptions typed on 8 1/2 x 11 paper are furnished when parcels of lots are to be purchased (See Examples 1 and 1-A). It will be noted that bearings are used where an angle point occurs within the lot. All calculations are checked by the method of coordinate traverse closure. The City employs its own legal department and title companies furnish all abstract information. The preparation of right-of-way data in the subdivided portion of the City would be relatively simple if all city streets were definitely located by street center lines or by city block monuments. In San Antonio there are only a few block monuments which were established years ago in the central business district. Since the Expressway routes follow relatively cheap city property, owners do not spend money for expensive surveys. Therefore, there are many conflicts in location of lot lines and corners. The title companies will not accept descriptions of lots where dimensions have been changed in any manner from its original purchase. If a 50-foot lot is now fenced 47.5 feet, field notes must be written for a 50-foot lot. Accordingly, the problem of correctly re-establishing all the lots in the area is encountered. With the use of survey base lines complete topography, coordinates, and large-scale layouts (1"=20') this work can be done in the office, eliminating days of expensive property surveys. After all lot lines have been established by coordinates, field notes are written for the lot parcels using a method of description that purchases a definite portion of the lot regardless of its location on the ground or its existing conflicts. One


CURVE DATA
RI. = 6804'10.077
Δ = 17°46'09.5
D = 1°00'00"
T = 895.65'
L = 69.583'
L = 1776.391'
R = 5729.578'
RAYBURN
ST.
MILITARY
CULLIN
DR.
Mc CAULEY
DR.
HILTON
AVE.
9727
9728
9783
9729
9726
9782
S 29°22'15"W
675'
EXCERPT OF CITY R.O.W. MAP
PLATE NO.1


(18)
Emil Wauters, et ux
Deed
Vol. 3769 Pg. 558
Sta. 217+00.10 to Sta. 226+19.48
6.560 Ac
BARN
TANK
CURVE DATA
RI. Sta. 232+00.894
Δ = 40°06'10"
D = 1°15'00"
R = 4,583.662'
T = 1672.974'
E = 295.764'
L = 3208.222'
C. F. KING SURVEY NO. 15
ABSTRACT NO. 395
COUNTY BLOCK 5099
N. C. B. 10568
N63°53'22"E 220.42'
N58°34'09"E 413.41'
288.190'
BARN
179.89'
219.00'
165.00'
150.00'
225
220
N63°49'05"E
R=4733.662'
625.120' ARC
N53°32'39"E 294.73'
SURVEY NO. 15
SURVEY NO. 152
TRACT 2
S.A. & M.G. R.R. SURVEY NO. 152
ABSTRACT NO. 719
COUNTY BLOCK 5674
N. C. B. 10571
EXCERPT FROM
R.O.W. MAP
PLATE NO. 2

FIELD NOTES
FOR U.S. HIGHWAY 81 EXPRESSWAY
RIGHT-OF-WAY

Part of Lot 7, New City Block 9729

BEGINNING at the existing Southwest corner of Lot 7, New City Block 9729; in the City of San Antonio, said point also being the point of intersection of the division line between Lot 6 and Lot 7 and the North line of Rayburn Drive;

THENCE, in a Northerly direction along the division line between Lot 6 and Lot 7, a distance of 58.57 feet to a point for a corner;

THENCE, in a Northeasterly direction, a distance of 105.78 feet, more or less, across Lot 7 to a point for a corner on the division line between Lot 7 and Lot 8, said point being 14.20 feet Southward from the South line of an alley measured along the said division line between Lot 7 and Lot 8;

THENCE, in a Southerly direction along the division line between Lot 7 and Lot 8, a distance of 148.91 feet to the Southeast corner of Lot 7 on the North line of Rayburn Drive;

THENCE, in a Westerly direction along the South line of Lot 7 and the North line of Rayburn Drive, a distance of 55.00 feet, more or less, to the point or place of BEGINNING.

This conveyance is made for the purpose of constructing a highway facility which the State of Texas, acting by and through the State Highway Commission, plans to ultimately develop as a Freeway with adjacent outer Frontage Roads. When completed and operated as a Freeway the grantors remaining property shall abut and have access to the abutting Frontage Road, and his use of and access to the Freeway lanes shall be subject to the same regulation by legally constituted authority as applies to the public use thereof. Any and all abutter's rights of direct access to the Freeway lanes are hereby released and relinquished to the grantee.

EXAMPLE NO. 1

Texas Highway Department
Form 884 8-54-11m

86611-884-11m

RIGHT-OF-WAY DEED

STATE OF TEXAS
County of Bexar

} KNOW ALL MEN BY THESE PRESENTS:

That

of the County of , State of Texas, for and in consideration of the sum of DOLLARS, to in hand paid by the State of Texas, acting by and through the State Highway Commission, receipt of which is hereby acknowledged, have this day sold, and do by these presents grant, bargain, sell and convey unto the State of Texas, all that certain tract or parcel of land, situate in the County of Bexar, State of Texas, and being a portion out of C. F. King Survey No. 12, Abstract No. 395 and S.A.&M.G. R.R. Survey No. 152, Abstract No. 719, County Block 5076, and being a part of 20 Acres of land, more or less, designated as Tract 2 of a survey of 70.43 Acres, a plat of which is recorded in Vol. 9487, Page 201 of Deed and Plat Records of Bexar County, Texas conveyed by Emil F. Ackermann, et al to Emil Wauters

by deed dated the 14th day of July, 19 52, and recorded in Volume 3939, Page 379 of Deed Records of Bexar County, Texas; said tract or parcel of land herein conveyed, being subject to:

(Important Note: If no liens, leases or easements exist, insert the word "None.")

lien(s) held by (Name) (Address)

easement(s) held by (Name) (Address)

lease(s) held by (Name) (Address)

and being more particularly described as follows, to-wit:

BEGINNING at the intersection of the existing Northeast line of the Emil Wauters property and the Northwest right-of-way line of the proposed location of U.S. Highway 81, said point also being S. 37°26'10" E., - 311.52 feet from the existing North corner of the Emil Wauters property and the existing West corner of the Louis Ciambernardi property on the existing Southeast line of Seguin Road;

THENCE, S. 37°26'10" E., - 308.03 feet along the existing Northeast line of the Emil Wauters property and the existing Southwest line of the Louis Ciambernardi property, crossing the centerline of U.S. Highway 81 at 130.43 feet at Engineer's Survey Station 226+19.48, to a point for a corner on the Southeast right-of-way line of said Highway;

EXAMPLE NO. 2

FIELD NOTES
FOR U.S. HIGHWAY 81 EXPRESSWAY
RIGHT-OF-WAY

All of Lots 14, 15, 16, 17 and 18 and Part of Lots 10, 11, 12 and 13, New City Block 9726

ALL of Lots 14, 15, 16, 17 and 18, New City Block 9726 and a part of Lots 10, 11, 12 and 13, New City Block 9726 in the City of San Antonio described by metes and bounds as follows:

BEGINNING at the existing Southeast corner of Lot 13, New City Block 9726, in the City of San Antonio, said point also being the point of intersection of the division line between Lot 13 and Lot 14 and the North line of Military Drive;

THENCE, in a Westerly direction along a bearing of S. 89°53'45" W., a distance of 171.03 feet along the North line of Military Drive and along the South line of Lots 13, 12, 11 and 10 to a point for a corner on the South line of Lot 10, said point also being N. 89°53'45" E., a distance of 18.97 feet measured along the North line of Military Drive from the intersection with the West line of Hilton Avenue;

THENCE, in a Northeasterly direction along a bearing of N. 48°01'04" E., a distance of 43.48 feet, more or less, across the Southeast corner of Lot 10 and to a point for a corner in Lot 11, crossing the division line between Lot 10 and Lot 11 at 8.09 feet, more or less;

THENCE, in a Northeasterly direction along a bearing of N. 30°47'54" E., a distance of 191.57 feet, more or less, across Lot 11 and Lot 12 and the Northwest corner of Lot 13 to a point for a corner on the division line between Lot 13 and Lot 14, said point being N. 89°53'45" E., a distance of 18.70 feet from the Northwest corner of Lot 13 measured along the said division line between Lot 13 and Lot 14;

THENCE, in an Easterly direction along a bearing of N. 89°53'45" E., a distance of 40.30 feet along the division line between Lot 13 and Lot 14 to the Northeast corner of Lot 13;

THENCE, in a Southerly direction along a bearing of S. 0°05'45" E., a distance of 193.40 feet along the division line between Lot 13 and Lot 14 to the point or place of BEGINNING.

This conveyance is made for the purpose of constructing a highway facility which the State of Texas, acted by and through the State Highway Commission, plans to ultimately develop as a Freeway with adjacent outer Frontage Roads. When completed and operated as a Freeway, the grantors remaining property shall abut and have access to the abutting Frontage Road, and his use of and access to the Freeway lanes shall be subject to the same regulation by legally constituted authority as applies to the public use thereof. Any and all abutter's rights of direct access to the Freeway lanes are hereby released and relinquished to the grantee.

EXAMPLE NO. 1-A

TEXAS HIGHWAY DEPARTMENT
SAN ANTONIO EXPRESSWAY
DISTRICT NO. 15

R.O.W. Area — NE + +
Tract 18 — NW + −
SW − −
SE − +

Project U.S. 81 East
Date 4-12-56
Computed By G.S.M.
Checked By H.M.S.

Description of Point	Bearing	Distance	Cosine	Sine	N	E
S.W. R.O.W. Cor.					29487.945	36736.348
	N37°01'06"W	331.641'	.79677607	.60427468		
N.W. R.O.W. Cor.					29762.189	36536.146
	N63°58'52"E	220.474'	.44010461	.89754681		
Angle Pt. at S.L.t. Sta 21+00.00					29849.225	36734.120
	N58°34'08"E	413.414'	.52146883	.85327030		
Pt. 150' Lt. Sta. 223+28.00					30064.803	37086.873
(Chord)	N61°51'11"E	288.139'	.61628401	.78782398		
N.E. R.O.W. Cor.					30242.378	37313.790
	S31°26'10"E	308.034'	.79403166	.60787641		
S.E. R.O.W. Cor.					29997.785	37501.036
	S58°32'39"W	294.727'	.52920295	.84831514		
Pt. 150' Rt. Sta. 223+28.00					29822.665	37263.383
(Chord)	S61°36'01"W	624.679	.53582270	.84439052		
S.W. R.O.W. Cor.					29487.945	36736.348

Double Area = 563,887 s.f.
Area = 281,944 s.f.
Plus Segment 1 = 4,263 s.f.
Minus Segment 2 = 448 s.f.
Total Area = 285,759 s.f. ÷ 43,560 = 6.560 Ac.

Area Segment No. 1

$\text{Area} = \frac{RL - C\sqrt{R^2 - (\frac{C}{2})^2}}{2}$

$\frac{4733.662 \times 625.120 - 624.679\sqrt{4735.662^2 - 312.340^2}}{2} = 4,263$ s.f. (Plus)

Area Segment No. 2

$\text{Area} = \frac{RL - C\sqrt{R^2 - (\frac{C}{2})^2}}{2}$

$\frac{4433.662 \times 288.139 - 288.139\sqrt{4433.662^2 - 144.070^2}}{2} = 448$ s.f. (Minus)

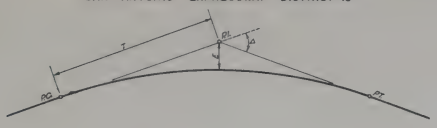
SAMPLE TRAVERSE CLOSURE & AREA COMPUTATION
EXAMPLE NO. 3

must make sure, however, that sufficient right-of-way will be secured for the proposed construction regardless of how it's staked. To refrain from being responsible for future land difficulties and to not infringe on private engineering practice, the San Antonio Expressway Office refrains from staking right of way which would establish property and street lines. Wooden stakes are set out marked "Construction Limits."

The County purchases all right of way on Texas Highway Department Right-of-way Deed Form No. 274. and field note description and acreage

TEXAS HIGHWAY DEPARTMENT

SAN ANTONIO EXPRESSWAY - DISTRICT 15



PROJECT U.S. 81 East
DATE 4-12-56
COMPUTED BY O.S.M.
CHECKED BY: H.H.S.

PI STA 232+00.89

FORMULA	CURVE DATA	FORMULA	CURVE DATA
Bearing to PI	N. 63°49'05" W.	Tan Δ/2	.36408629
Bearing from PI	N. 23°42'55" E.	Δ/2	10°01'32.5"
Δ 40.1027778°	40°06'10"	Tan Δ/2	.17678942
Dc	1°15'00"	T=R Tan Δ/2	1,672.97'
R 5729.57744 / Dc	4,583.662'	E=T Tan Δ/2	295.76'
Δ/2	20°03'05"	Lc=Dc/100	3,206.222'

CO-ORDINATE CLOSURE

DESCRIPTION OF POINT	BEARING	DISTANCE	COSINE	SINE	N	E
PI Sta 232+00.89					30268.155	37993.126
	N63°49'05"W	1,672.97	.44122308	.89739746		
PC Sta 215+27.920					29530.000	36491.803
	N26°10'55"W	4,583.662	.89739746	.44122308		
PT Sta 247+36.142					33643.367	38469.386
	N66°37'05"W	4,583.662	.40219192	.91555538		
	S23°42'55"W	1,672.97	.91555538	.40219192	33799.855	38665.982
PI Sta 232+00.89					30268.155	37993.126

SAMPLE CIRCULAR CURVE CALCULATION EXAMPLE NO. 4

8-1-55

CONTROLLED ACCESS CLAUSES TO BE USED FOR EXPRESSWAY RIGHT-OF-WAY

I. City - Frontage Roads to be Constructed

This conveyance is made for the purpose of constructing a highway facility which the State of Texas, acted by and through the State Highway Commission, plans to ultimately develop as a Freeway with adjacent outer Frontage Roads. When completed and operated as a Freeway, the grantors remaining property shall abut and have access to the abutting Frontage Road, and his use of and access to the Freeway lanes shall be subject to the same regulation by legally constituted authority as applies to the public use thereof. Any and all abutter's rights of direct access to the Freeway lanes are hereby released and relinquished to the grantee.

II. County

This conveyance is made for the purpose of constructing a highway facility which the State plans to ultimately develop as a Freeway with adjacent outer Frontage Roads. When completed and operated as a Freeway, the grantors remaining property shall abut and have access to the abutting Frontage Road, and his use of and access to the Freeway lanes shall be subject to the same regulation by legally constituted authority as applies to the public use thereof. Any and all abutter's rights of direct access to the Freeway lanes are hereby released and relinquished to the grantee.

III. City - No Frontage Roads

It is further understood and agreed that the consideration received by the grantor is also in full payment for all damages to the remaining property, if any, of the grantor, together with the denial of access or right of ingress and egress to the Freeway from such property remaining in possession of the grantor.

EXAMPLE NO. 5

are required for each tract or parcel. This method requires that the Highway Department abstract the title of all land involved. This requires the time-consuming process of one employee going through the County records tracing ownership. It would be more satisfactory and less expensive in the end if a title company could be hired to do this work since their records are always up to date. Plate 2 shows a portion of the right-of-way map which is furnished the County. Example 3 shows the method of checking all calculations by coordinate traverse. Using this same calculation and an electric ten-column calculator, the areas can be accurately computed. This is accomplished by adding the sum of all the products of the Northings times the Eastings and leaving the result in the calculator, subtracting the product of all the Eastings times the Northings (see directional arrow on sample form). The result will be the double area in square feet. Dividing by two and by 43,560 will give the area in acres. Where curves are involved, as in this example, the traverse is computed using chord lengths. Then the additional segment area is added or subtracted as the case may be. All alignment circular curves are computed and checked by using a form prepared by the San Antonio Expressway Office as shown by Example 4. Calculations shown by Examples 3 and 4 cover the right of way shown in Plate 2.

Example 5 shows the standard paragraphs that are included in the City and County right-of-way deeds for controlled access when an owner had remaining property adjacent to the expressway.

From discussions with members of other expressway organizations in the state it is found that each has a different method of handling right-of-way details with the cities and counties. A program for standardizing right-of-way procedure over the entire state is needed with a study of simplifing methods wherever possible.

The above were honored at the April 26 Commission meeting for their 25 or more years of service with the Department.

30-YEAR AWARDS

D-11	Hazel M. Bergstrom, Senior Office Assistant
District 2	Albert D. O'Neal, Skilled Laborer
	James M. Zeigler, Skilled Laborer
District 3	R.B. Blankenship, Skilled Laborer
District 5	Jake Webb, Senior Maintenance Foreman
District 7	Charlie Gunn, Skilled Laborer
District 8	D.L. Carman, Senior Maintenance Foreman
District 10	Arthur Ash, Skilled Laborer
	Junius F. Richardson, Skilled Laborer
	Thomas S. Watson, Patrolman
District 11	Archie L. Hodges, Skilled Laborer
	Joseph W. McGraw, Skilled Laborer
District 12	Manuel Davila, Skilled Laborer
District 15	H.G. Roberson, Senior Maintenance Foreman
District 16	Pablo Trevino, Skilled Laborer
District 17	B.G. Capps, Senior Maintenance Foreman
	George F. Wingard, Skilled Laborer
District 18	E.B. Calvin, District Construction Engineer
District 20	Adolphus Drake, Construction Foreman
District 21	Manuel J. Gonzalez, Skilled Laborer
District 23	L.C. Cleveland, Senior Maintenance Foreman

25-YEAR AWARDS

D- 4	Fronie E. Krolczyk, Procurement Clerk
D- 5	Ocie C. Kluge, Senior Draftsman
D- 6	Jeff W. Seay, Supervising Field Engineer
D- 8	Bertha S. Mifflin, Junior Clerk
D- 9	J.G. Gault, Senior Administrative Aide
	Daphne Heath, Laboratory Clerk
	John E. Hunt, Senior Soils Engineer
	Sidney S. Townsley, Section Supervisor

AWA

In this "Honor Roll" of me
received awards at the April
35, 30, and 25 years with the I
achievement of years of loyal
newer employees, for their y
both to the Department and to t

The number of recipients o
almost impossible to give life
is with some regret that we list o
To each one, however, we se
wishes. It is the sincere wish
an extra award, they know an
and esteem that their fellow wo

35-YEAR AWARDS

D- 7	Harvey E. Deen, E
D-10	H.P. Stockton Jr.,
District 6	Starks C. Dougherty
District 9	Obra C. Pierce, Se
District 11	Rufus Warren, Senic
District 13	Hilmar P. Krause, S
District 17	Bertram Hedick, Se
District 20	Virgil O. Ellis, Ad
	Walter E. Suter, Se
District 22	McCloud B. Hodges

RDS

nd women are listed those who
May Commission Meetings for
artment. Recognition for their
rvice should set an example for
s of public service are a credit
State.
ich awards has grown until it is
etches of each employee, and it
the names of these employees.
our congratulations and best
all who work with them that, as
ealize the friendliness, regard,
rs hold for them.

neer of Aid Projects
nager, Highway Planning Survey

enior Resident Engineer
r Equipment Supervisor
Maintenance Foreman
or Resident Engineer
Resident Engineer
ry Engineer
r Resident Engineer
istrict Engineer

There were 22 districts and four divisions represented by the 48 employees who received awards in May.

25-YEAR AWARDS (CONTINUED)

D-10	Richard H. Spiller Jr., Office Engineer
D-11	Jay D. Howell Sr., Senior Field Auditor
D-14	Wilfred F. Gustafson, Supervising Designing Engineer
D-18	Edney E. Caskey, Maintenance Clerk
D-20	R. Schieffer, Assistant Director, Insurance
District 1	Charlie S. Adair, Special Foreman
District 2	R. Haberzettle, Senior Maintenance Foreman
	Lonnie E. West, Semi-Skilled Laborer
District 3	Floyd W. Barnes, Skilled Laborer
	McRoy Hodges, Senior Warehouseman
District 4	Leo K. Cantrell, Senior Resident Engineer
	A.R. Morgan, Senior Maintenance Foreman
	M.J. Wolfrum, Senior Maintenance Foreman
District 5	H.C. Edmonds, Senior Maintenance Foreman
District 6	Eugene A. Kelly, Senior Resident Engineer
	R.E. Ward, Senior Maintenance Foreman
District 7	Jim Butler, Senior Maintenance Foreman
District 8	Alva J. Boyles, Skilled Laborer
	Eric Matthews Jr., Chief Inspector
District 9	William C. Elkins, Skilled Laborer
	Wasson E. Garrett, Semi-Skilled Laborer
	Henry C. Loftis, Skilled Laborer
	Bruce R. Morton, Resident Engineer
	Thomas W. Porter, General Foreman
District 10	James A. Brotherton Sr., Skilled Laborer
	Thomas E. Cole, Skilled Laborer
	Joe B. Crow, Construction Foreman
	James C. Gill, Semi-Skilled Laborer
	Louie F. Lane, Semi-Skilled Laborer
	Clyde McKay, Skilled Laborer
	Carl P. Wade, Skilled Laborer

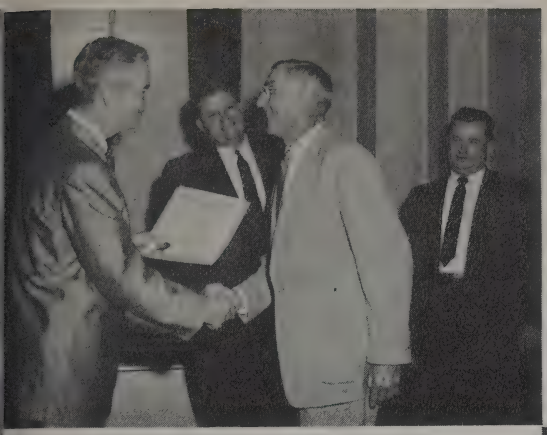
District 11	Robert H. Guinn, Senior Party Chief
	Victor G. Koch, District Engineer
	Hallie B. McKenzie, Skilled Laborer
	W. O. Womack, Senior Maintenance Foreman
District 12	John W. Dennis, Skilled Laborer
	Alphonse Junger, Skilled Laborer
	Noah B. Lester, Chief Inspector
	Herbert F. Pfeffer, Bridge Tender
	William L. Werneburg, General Foreman
District 13	Godfrey Prokop, Skilled Laborer
District 14	W. E. Baker, Senior Maintenance Foreman
	Max Barth, Skilled Laborer
	Gracino Cortez, Skilled Laborer
	Erhardt H. Sanders, Skilled Laborer
District 15	Beulah C. Jenkins, Senior Resident Engineer
	Adolf Machotka, Senior Engineering Assistant
	Walter E. Schrank, Skilled Laborer
District 16	Hayes S. Taylor, Senior Party Chief
District 17	Oscar L. Crain, Assistant District Engineer
	Albert W. Massey, Skilled Laborer
	Clyde Webb, Senior Maintenance Foreman
District 18	Benjamin F. Ferrell, Skilled Laborer
	Robert P. Rainey, Skilled Laborer
District 19	R. L. Calloway, Senior Maintenance Foreman
	Ausker B. Hammonds, Skilled Laborer
	George H. Jones, Skilled Laborer
	Audie L. Murph Sr., Semi-Skilled Laborer
District 20	L. M. Bilbo, Senior Maintenance Foreman
	Burton R. Gant, Skilled Laborer
	Cedric I. Gray, Chief Inspector
	Ernest Tatum, Semi-Skilled Laborer
	J. L. Woosley, Senior Maintenance Foreman
District 21	Filemon Garza, Senior Maintenance Foreman
	Tracey L. Haliburton, Senior Maintenance Superintendent
	James O. McKenzie, Chief Inspector
District 23	George C. Ellis, Skilled Laborer
	Carlos L. Patterson, Skilled Laborer
	Thomas W. Smith, Senior Resident Engineer
District 25	Ernest L. Rickman, Skilled Laborer

Obra C. Pierce–35 years.

H. P. Stockton Jr.–35 years.

Walter E. Suter–35 years.

Harvey Deen–35 years.



Rufus Warren-35 years.

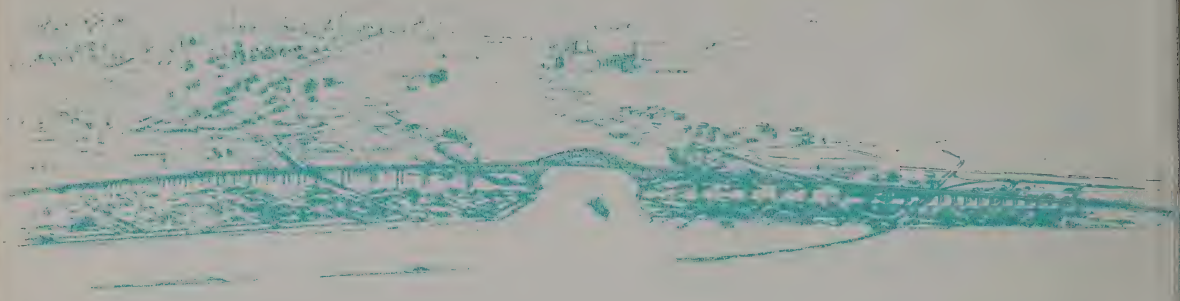
Bertram Hedick-35 years.

M.B. Hodges-35 years.

Starks C. Dougherty-35 years.

Hilmar P. Krause-35 years.

V.O. Ellis-35 years.



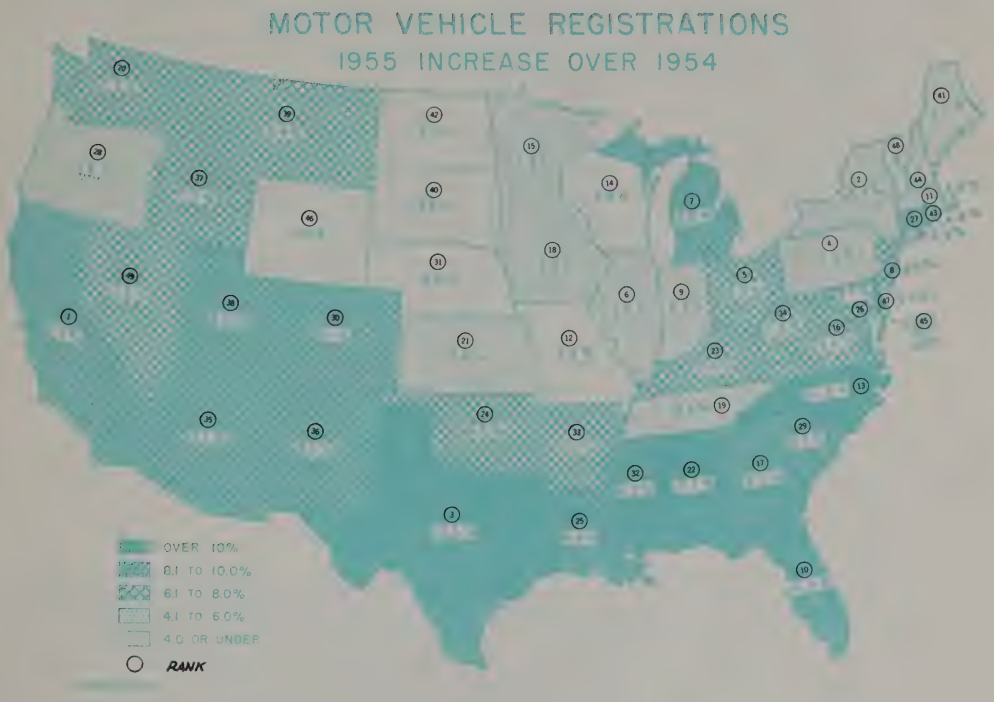
Corpus Bridge Under Way

The first contract has been let for the construction of what will be the Texas Highway System's most expensive bridge, climaxing almost two years of planning by both local and state agencies.

The Corpus Christi Ship Channel Bridge on U. S. 181 and State 35 will be built under four separate contracts. Contract Number 1 was let May 16 for $1,386,566.41. This first phase of construction will include about 1,000 feet of prestressed concrete girder spans on each end of the bridge with the foundations and approach grading. Contract Number 2 will involve all of the foundations for the remainder of the bridge. The third contract will cover the furnishing and erection of the steel truss portion of the bridge in the center. The fourth contract will cover the steel girder part of the bridge, and the railing on the entire bridge.

A special Corpus Christi section of the Bridge Division has been set up to supervise the construction of the high-level bridge, with Lewis H. White, Senior Field Engineer, as head. Expected to take about two and one-half years to complete, the bridge will cost an estimated $9 million, will be the third highest structure on the highway system, and will be the largest structure ever designed by Highway Department personnel.

Designed to provide a vertical clearance of 140 feet and a horizontal clearance of 300 feet to allow passage of ships in the channel, the structure will replace the present two-lane drawbridge which creates a traffic bottleneck every time a vessel enters or leaves the port area. It will span both the old channel and the new channel which will be dredged into the turning basin by the Corps of Engineers. Some 28,000 cubic yards of concrete, 2,400 tons of reinforcing steel, and 9,000 tons of structural steel will be used in construction of the bridge which will provide two 36-foot roadways and will be 5,817 feet long.



Texas ranked third among the states in its increase in motor vehicle registration for 1955 over 1954, the Census Bureau has reported.

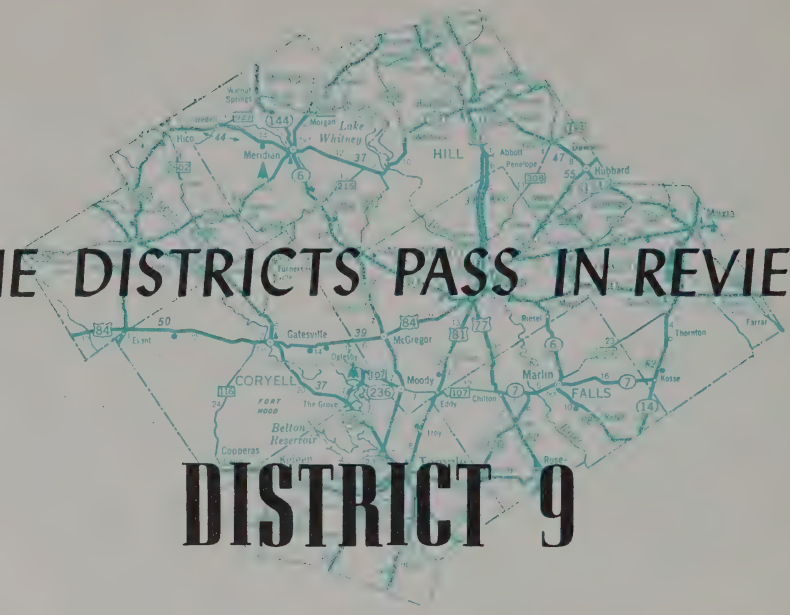
The Texas gain was 10.3 per cent, exceeded only by Florida, 14.8 per cent, and Alabama, 13.7 per cent. North Carolina was close behind Texas, with 10.2 per cent gain.

Motor vehicle registration in Texas in 1955 was counted at 3.9 million* compared with 3.5 million in 1954. The nationwide figure was 62.7 million, a 7.2 per cent increase in 1955 over 1954.

Texas now ranks third in the country in total motor vehicle registration. By the 1955 figures California was first, with 6.2 million, and New York second, 4.6 million.

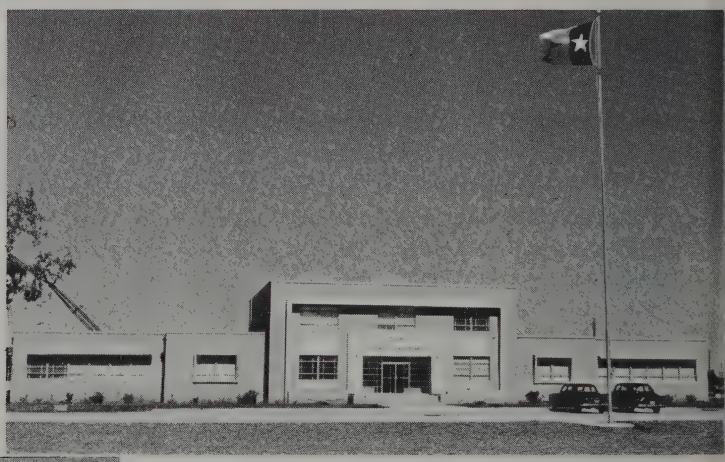
Texas trailed Pennsylvania in 1954 but passed the Keystone State in 1955, dropping it to fourth place in registrations.

*Preliminary data obtained from Leslie Mills, Chief Supervisor, Motor Vehicle Division, indicates that at the close of the registration year April 1, 1955, to March 31, 1956, there were 4.1 million registrations in the state.



THE DISTRICTS PASS IN REVIEW

DISTRICT 9



Completed in November, 1952, this new building in Waco houses District 9 headquarters.

Thomas C. Collier, District Engineer, and H.E. Chiles Jr., Chief District Accountant, start the day with a conference.

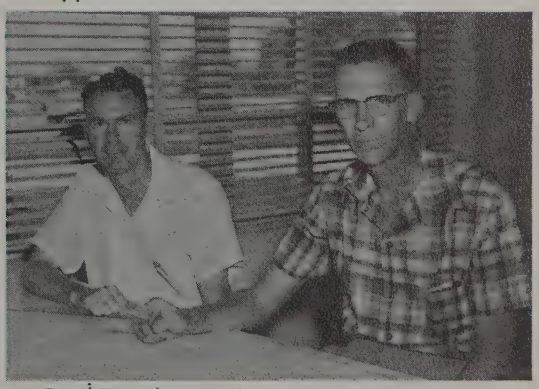
Waco, headquarters for District 9, is one city that learned long ago the impact adequate traffic facilities can have upon the life of a community. Like a lot of other places in Texas, it was once a typical Wild West town and, strangely, it was a bridge that was responsible for this chapter in its life. Prior to 1870, it was a quiet, dignified village, steeped in the traditions of the South. Then a suspension bridge was built across the Brazos River at Waco and things began to change. Since this was the only bridge spanning the Brazos, travelers heading west swarmed through the village, many of them settling there. Huge herds of cattle, wagons, and long freighting trains streamed across the bridge. Cowboys and lawless buffalo hunters roared into town. The quiet village was transformed into a wild frontier town with the usual notorious gambling halls and variety theaters.

Built on the site of an old Waco Indian village, Waco has grown steadily since its founding and is now an important industrial center in the eight-county district which is predominantly agricultural. The district lies almost half and half in the dark soils of the Grand Prairie and the deep, fertile soils of the Blacklands, extending slightly into the dark, fertile soils of the West Cross Timbers and the sandy soils of the East Cross Timbers. It encompasses some of the leading crop and livestock areas of the state.

The Waco District was created as Division 8 in 1920, abolished the following year, then recreated in 1924 when the number of divisions was increased to sixteen. It now has jurisdiction over about 2,000 miles of highway and employs approximately 585 persons to build and maintain these highways.

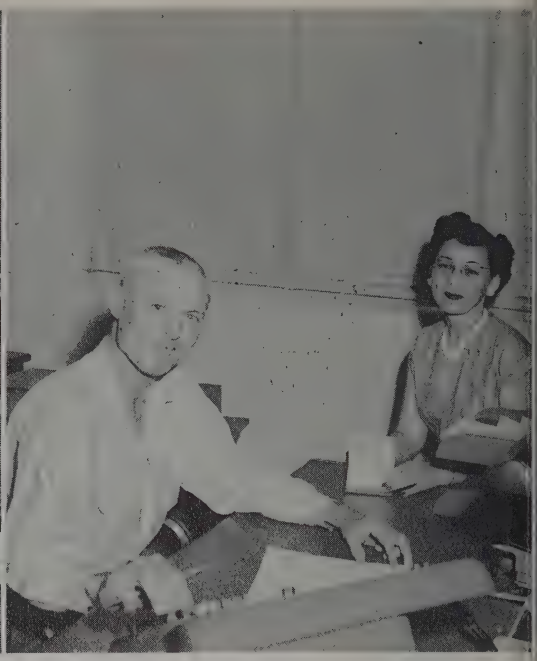
John Neubauer, District Designing Engineer, and Christopher C. Edwards, Senior Designing Engineer, discuss plans for a farm-to-market road in Coryell County.

High school graduations always bring a flood of requests for jobs. Here, James H. Aiken, Assistant District Engineer, reviews applications.



Fred Dougherty, Associate Designing Engineer, and W. M. Branch, Designing Engineer, work on a bridge layout on State 6 in Falls County.

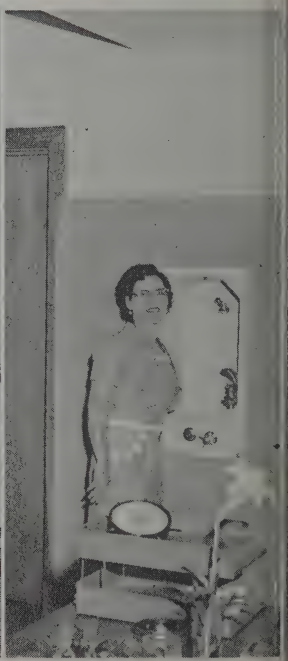
The district payroll is in the capable hands of Thelma Hallmark, Accountant; Peggy Byam, District Office Clerk; Elizabeth Morrow, Junior Clerk; and Jessie McCown, Junior Clerk.



Salary and labor problems are taken care of by H.V. Marchman, Accountant, and Elsie Langley, Junior Clerk and secretary to the District Engineer.

Highway log records are kept by Yvonne Vaughan and Ellen Cooper, Junior Office Assistants.

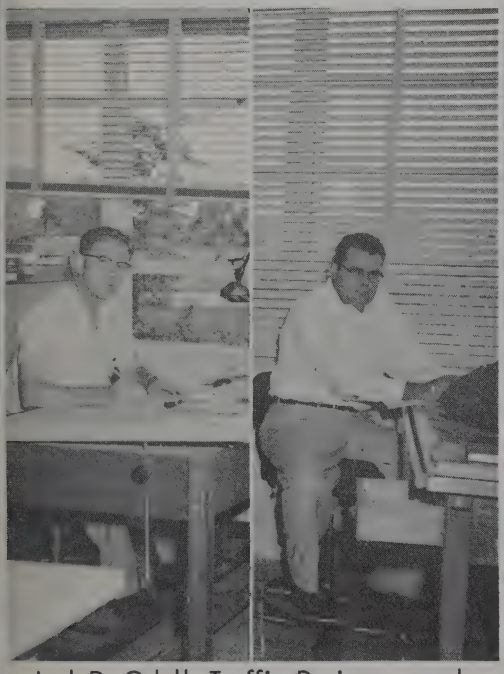
A resurfacing job in Hill County is under discussion by John W. Nichols, Maintenance Superintendent, and George G. Cleveland, Assistant District Maintenance Engineer.



Iva Zelta Richardson, Junior Clerk, is receptionist at the headquarters building.

J.A. Williams (seated), Senior Accountant, discusses accounting problems with William Gordon, District Office Clerk, and Helen Woodall and Merilyn Weir, Junior Clerks.

James Kelly, Laboratory Engineer, explains material pit layout for Evelyn Goolsbee, Junior Clerk.



Jack D. Odell, Traffic Designer, works on a proposal for the installation of traffic signals while Winston Smith, Senior Draftsman, prepares plans for a farm-to-market road.

District 9's bridge section discusses rigid frame design. This special section includes J.M. Graham (seated), Senior Resident Engineer; Carl K. Darnell, Junior Draftsman; Philip F. Parry, Senior Engineering Assistant; Hiram W. Westbrook II, Junior Draftsman; William P. Brewer, Junior Draftsman; and Edward L. Hardeman, Senior Designing Engineer (not included in the photograph).

Screening aggregate for seal coat tests are James Dalton, James Anderson, and Wayne Jones, Junior Laboratory Assistants.

Calvin Barnard, Junior Laboratory Assistant; Fred Grigsby, Laboratory Assistant; and Don McDaniels, Junior Laboratory Assistant; prepare triaxial samples to go into the capillary room.

Keeping grass trim along the Temple-Belton Expressway in Belton is the duty of Seth D. Caldwell, Semi-skilled Laborer; Robert W. Barton Jr., Common Laborer; and Olan C. Connell, Semi-skilled Laborer.

T.R. Clampitt and Don Wood, Skilled Laborers, prepare a new truck for use on the road.

Core Drilling Around the Capitol

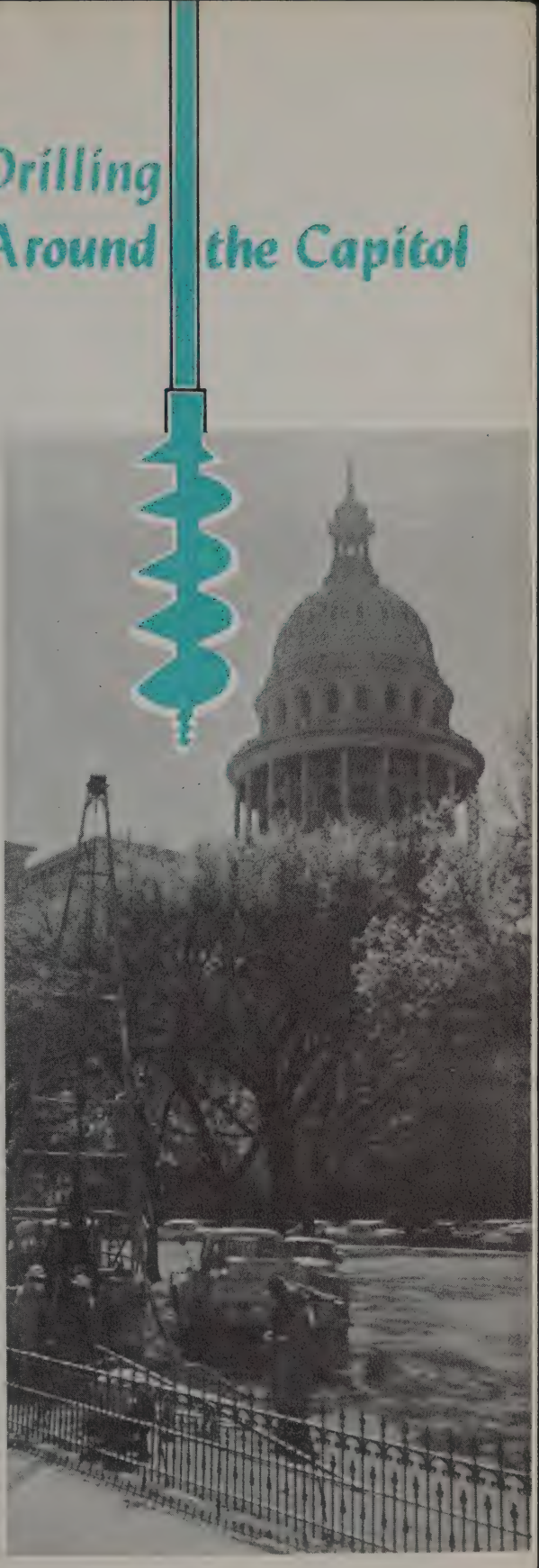
C.O. Duncan, Chief Core Driller
Equipment and Procurement Division

During the early spring days of March 5, 6, and 7, the dome of the State Capitol Building provided a unique background for a scene usually witnessed along some highway. A core-drilling crew was assigned to perform a series of foundation exploration tests on and around the Capitol grounds. These tests were requested of the Highway Department by the Texas State Building Commission whose plans include the construction of a State Courts Building and a State Office Building in the area bounded by Thirteenth, Fourteenth, San Jacinto, and Lavaca Streets in Austin.

Arrangements to allow the Department to perform the above-described tests included the preparation of an estimate of the costs and the preparation of an inter-agency contract agreement to permit remuneration by the Building Commission for services performed by the Highway Department.

The result of these tests was highly satisfactory in that the eight holes drilled in various locations in the area revealed the presence of White Austin Chalk beginning at depths ranging from two to eight feet. The eight holes varied in over-all depth from 25 to 40 feet, and the cores taken from them when placed under pressure in unconfined compression tests resulted in an average strength showing of 250 tons per square foot.

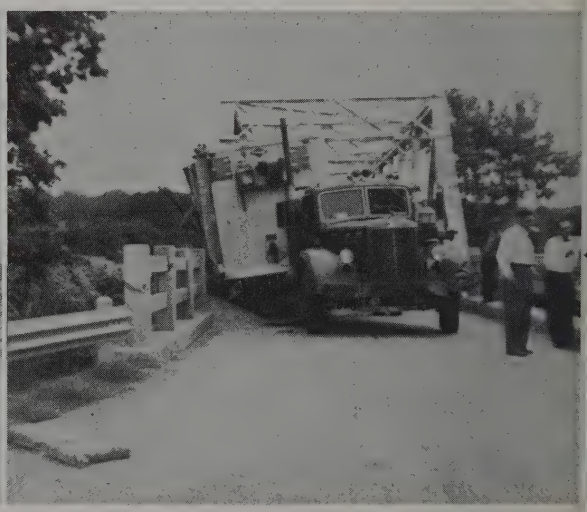
The photograph on this page shows the core-drilling crew with its rig in operation within a stone's throw of the Capitol.



Paluxy River Bridge Damage

Joe Bingham, District Maintenance Engineer
District 2

On the morning of May 15 at 3:30, this truck and trailer struck the Paluxy River Bridge on U.S. 67 in Somervell County, causing extensive damage.

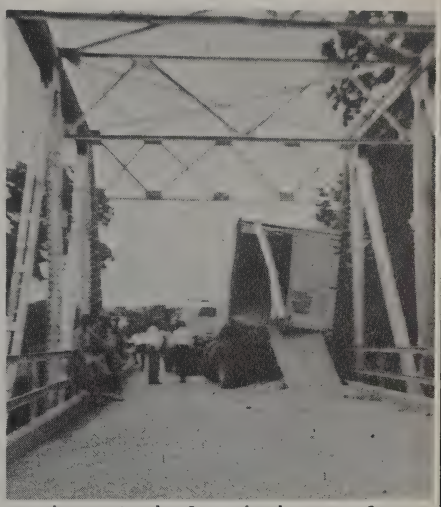


Loaded with oats being transported to the Gulf Coast, the truck approached the bridge from the north traveling too fast to make the sharp curve.

As it hit the concrete railing, the truck-trailer began to jack-knife.

Structural steel bridge members on both sides were subjected to heavy blows, but were strong enough to prevent the truck from overturning or making a complete jack-knife.

One vertical member, two adjacent diagonal members, and a portion of the top chord received the worst damage.



Early arrivals found plenty of oats for breakfast—the only humorous note at what could have been a tragic as well as destructive accident scene.

This detour, although a little wet, was in use while the bridge was closed. The repair work was finished June 1, 1956, at an estimated cost of approximately $10,000. A new bridge is programmed at a new location which will eliminate the hazardous bottleneck on U.S. 67 at the site of this latest in a long series of accidents.

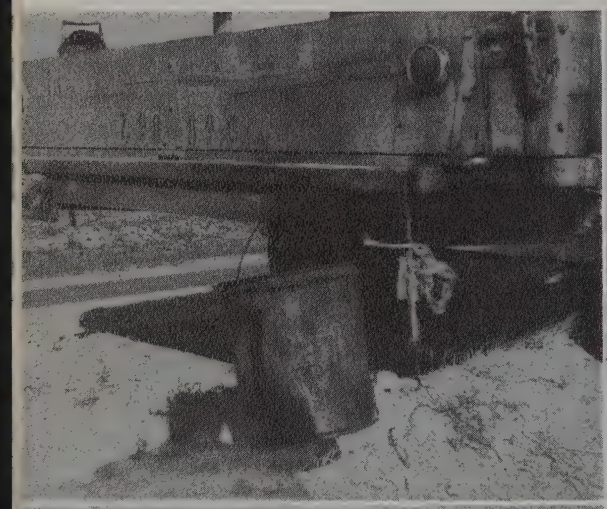
TRAILER for asphaltic concrete patching

R.N. Jennings, District Maintenance Engineer
District 7

trailer has been built in the district shop for use by maintenance crews in asphaltic concrete patching that we believe has many advantages

1. It permits work to be done with one less truck.
2. It provides a place for unwieldy straightedges.
3. It keeps cones and barricades cleaner by providing a place for transportation separate from asphaltic material.
4. The low level trailer is easily reached.
5. The tank holding water and emulsion with twin spigots permits any desired solution to be easily mixed for use as a tack coat.

Accompanying photographs of this trailer illustrate these points.



Personnel Changes

H. L. Arno, Director of Personnel

District 2

District Headquarters, Fort Worth: Wilton N. Hammond, Senior Resident Engineer, resigned April 23, 1956.

Expressway, Fort Worth: Robert W. Crook changed from Senior Designing Engineer to Assistant Expressway Engineer May 1, 1956.

District 4

County Residency, Borger, to Bridge Division, Austin: Lewis H. White, Senior Designing Engineer, transferred as Senior Field Engineer April 16, 1956.

District 7

County Residency, Junction: Grady L. Rogers changed from Resident Engineer to Senior Resident Engineer May 1, 1956.

County Residency, San Angelo: Gerald G. Lackey changed from Resident Engineer to Senior Resident Engineer May 1, 1956.

District 9

County Residency, Waco: Edward L. Hardeman changed from Designing Engineer to Senior Designing Engineer May 1, 1956.

District 12

District Headquarters, Houston: Martin O. Brown, Jr., changed from Designing Engineer to Senior Designing Engineer May 1, 1956.

District Headquarters, Houston: Cecil Weil changed from Designing Engineer to Senior Designing Engineer May 1, 1956.

District 18

District Headquarters, Dallas: Elmer B. Calvin, District Construction Engineer, accepted retirement March 31, 1956.

District Headquarters, Dallas, to County Residency, Dallas: Marquis G. Goode, Jr., Senior Resident Engineer, transferred May 1, 1956.

District 20

County Residency, Woodville: William A. Potter changed from Resident Engineer to Senior Resident Engineer May 1, 1956.

District 21

County Residency, Falfurrias, to County Residency, Pharr: Shelby T. Crosby, Resident Engineer, transferred as Senior Resident Engineer May 1, 1956.

District 25

County Residency, Quitaque: Ober V. Johnson changed from Resident Engineer to Senior Resident Engineer May 1, 1956.

Houston Urban Project:

Earl G. Odell, Jr., changed from Senior Designing Engineer to Senior Resident Engineer May 1, 1956.

Bridge Division, Austin:

T. B. Wall, Jr., changed from Chief Welding Inspector to Welding Specialist April 1, 1956

Land Service Roads Division, Austin:

To Road Design Division, Austin, Edward M. Carl, Jr., Senior Designing Engineer, transferred May 1, 1956.

Materials and Tests Division, Austin:

Avery W. Smith changed from Soils Engineer to Senior Soils Engineer May 1, 1956.

Road Design Division, Austin:

Paul W. Griffith changed from Designing Engineer to Senior Designing Engineer May 1, 1956.

Hubert A. Henry changed from Senior Geologist to Senior Designing Engineer May 1, 1956.

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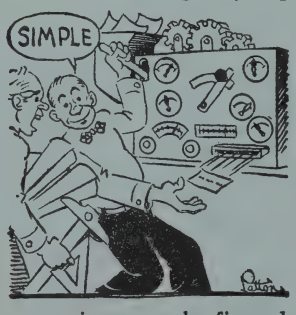
HIGHWAY IN THE NEWS



The Texas Highway Department is turning to automation to help beat the shortage of engineers. Now under way are plans for a highway south of San Antonio with all preliminary work done from aerial photographs—no surface surveying requiring more trained manpower. The department also is installing an electrical computer—the so-called "mechanical brain"—to work its mathematical problems. A job formerly requiring three weeks' work by an engineer can be figured mechanically in less than 10 minutes.

Safety Angles

Bartley Harris, Skilled Laborer
District 15

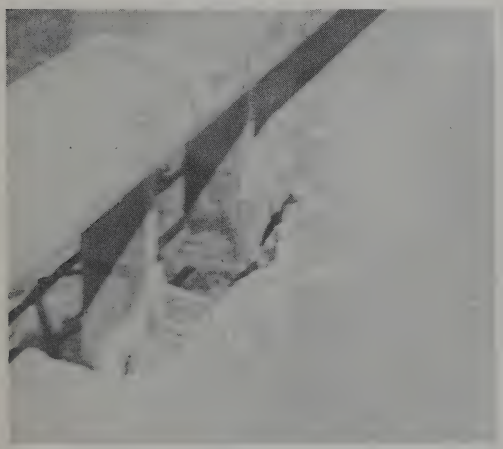
Making minor repairs to structures that have been damaged by automobile or other vehicle collision becomes quite a problem at times with the Texas Highway Department.

In District 15, particularly along the Urban Expressway Route in San Antonio, M. D. L. Jordan, Senior Maintenance Foreman, has had the problem of figuring out a scaffolding on high structures which would allow the men to work safely. He also has had difficulty in holding the form boards securely in place without going to a lot of costly scaffolding while making repairs to bridges and overpasses.

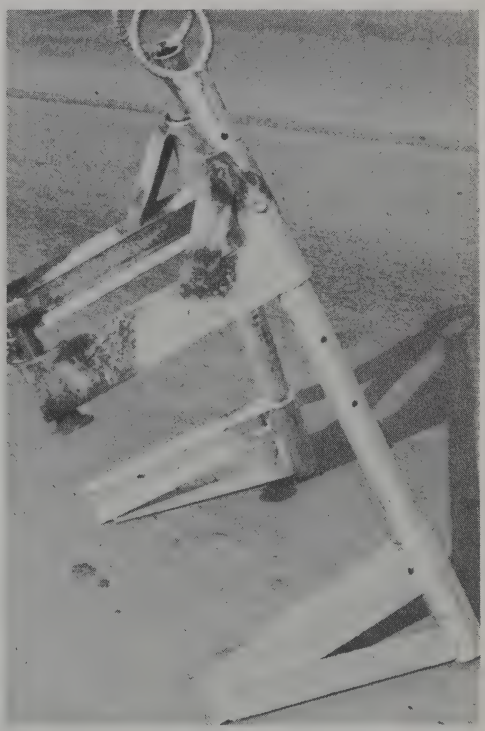
Bartley Harris, Skilled Laborer who works with Jordan, came up with the idea of building a steel safety cage and, also, two sets of large "C" clamps for this type of work. The work of building the cage and clamps was done in a local welding shop.

The safety cage is built of five-eighths-inch round reinforcing steel with one-half-inch marine plywood for flooring. Large hooks are made on top of the cage to hang it from the side of a structure to be repaired. The cage is seven feet long, two feet wide, and six feet deep.

The cage has been very successful from a safety standpoint and has also proven to be a device both fast-moving and easy-mounted for bridge repair work. You will note that there are safety chains on each side to be

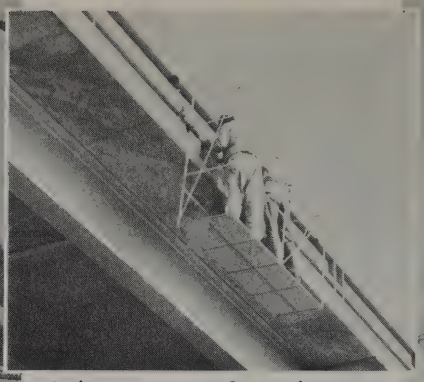


Broken concrete curb around a rail post.



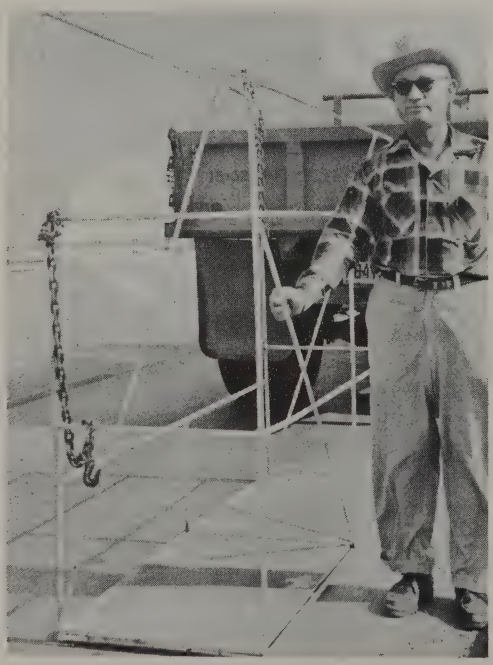
Two completed "C" clamps.

"C" clamp in place on a bridge holding the concrete form.



A distant view of cage hanging on side of bridge.

Close-up of cage hanging on side of bridge.



Completed safety cage.

attached to the bridge railing for extra safety. In some cases where the railing has been torn loose, it will be advisable to chain the railing to a truck or some object for extra support. The men are also required to wear safety belts while working on high structures where danger warrants their use.

The large "C" clamps are made of one and one-half inch pipe, and three inch channel iron for jaws. The pipe is reinforced with an extra piece of two-inch pipe at the top and bottom which acts as an adjustment factor at the top. Holes are bored on four-inch centers and are held to desired place of adjustment with three-eighths-inch bolts. Final adjustments are made on the end of the jaw with a large one-inch set screw. The jaws are fourteen inches deep and will open to a maximum of twenty inches. Handles are made of one-half-inch round steel and welded on top for easy handling, and can also be used to lock with chain when left overnight.

We have found these clamps very useful, simplifying and expediting repair work.

Speed vs. good highways. . .

. . . The legal speed limit seems slow on your good highways. We would appreciate a sign leaving each major city indicating distance to next roadside park. You have good highways and good roadside parks. We like the choice of bypass or business route on highways through and around cities.

Little Rock, Arkansas

What, a bragging Texan?

. . . If you will excuse the following from an oldtimer, I would like to do some Texas bragging. I have traveled many, many miles on Texas roads —most of them good, some of them excellent—in 234 of Texas' counties and I love every mile of them. But my particular brag is about your beautiful roadside parks. My wife and I like to fix up picnic lunches and along about lunch time we begin to look for one of your lovely roadside parks and there we stop and rest, and most of the time we find the park located in a shady and beautiful spot. And now I come to what I really want to brag about. A few days ago we went to Tyler and since the last time we were down there, you had really spread yourself on a lovely spot a few miles west of Tyler on State 64. It was on the hillside with steps leading to the tables and picnic units. We have been in a good many states but have found nothing to compare with this. And we like your plan of little green spots on your Texas map to guide us to a nice picnic spot. Thanks and keep up the good work. . .

L. E. Matlock
Dallas, Texas

We're building them. . .

. . . You have good highways but you need freeways through large cities. . .

Portland, Oregon

Courtesy is always appreciated. . .

. . . I sincerely hope that some day every state in the Union will be as helpful and as courteous to its travelers as the State of Texas. I think your information stations at the borders fulfill a real need and that the personnel has been well chosen and well trained. . .

R. A. Muessel
South Bend, Indiana

It's a pleasure!

. . . Your post card for comments isn't big enough. We've just spent a wonderful two weeks in Texas, and couldn't possibly put our comments and our thanks in that limited space.

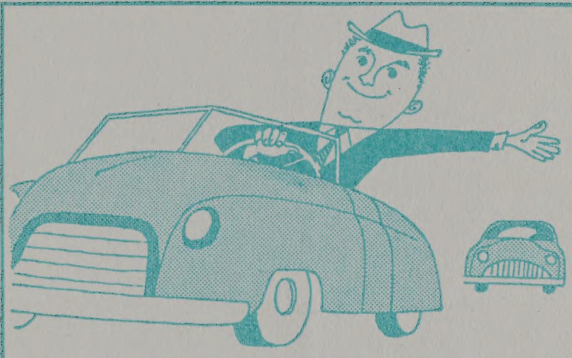
We have never been in Texas before, and didn't know anybody there, but had heard so much about the state that we decided to go see it for ourselves. So, first of all, we're very grateful to your Travel Information Office in Wichita Falls. We "blew in" there in the midst of a dust storm which had us completely bewildered and frustrated and nearly ready to turn home again, but your representative there spent a lot of time and effort helping us plan a good trip through the state, marked maps for us, loaded us up with folders about places to visit, and told us about all sorts of interesting things to do and see. Without his help, we would have missed so much.

We think your highways are absolutely magnificent—the best we have ever seen—and very attractive, with such neat, well-kept edges, grass and weeds mowed like a lawn. Our trip down Highway 87 in East Texas was like driving through a beautiful park. And your roadside picnic areas are a feature that other states should copy.

We had a grand trip, and certainly saw as much of Texas as we could—north, south, east, and west—from dust storm to snow storm to sunshine and fog; from cattle country to vegetable fields; from high mountains to Gulf Coast; from desert cactus to tropical magnolias and palm trees; from salt mine to Aquarena.

It was really a wonderful vacation trip—we couldn't have had it without those Texas Highways to drive on—and we would have missed a lot without that Information Office at Wichita Falls. So thanks very much to all of you. . .

Sam Miller
Los Angeles, California



Mind your motor manners—and *live!* You'd be surprised how many accidents are prevented by highway courtesy. So, think of the other fellow—in passing, on hills, around curves. Drive among your neighbors as you'd have them drive by you! Chances are you'll live longer. And so will your neighbors!

Be Careful—the life you save may be your own!